UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

July 12, 2001

MEMORANDUM

SUBJECT: **Oxyfluorfen**. Anticipated Residues and Dietary Exposure Analyses for the HED Human Health Risk Assessment. Chemical No. 111601. DP Barcode D275401.

FROM: José J. Morales, Chemist
Reregistration Branch III
Health Effects Division (7509C)

THROUGH: David Soderberg
Sheila Piper
Dietary Exposure Science Advisory Council
and
Catherine Eiden, Branch Senior Scientist
Reregistraton Branch III
Health Effects Division (7509C)

TO: Felica Fort
Reregistration Branch 1
Health Effects Division (7509C)
and
Deanna Scher
Chemical Review Manager
Special Review and Reregistration Divison (7508C)

Action Requested and Background

In order to complete the Agency's preliminary human health risk assessment for oxyfluorfen, prepare a (Tier 2/3) chronic dietary exposure and risk analyses which incorporate both existing uses as well as a two IR-4 actions (grass grown for seed and strawberries).

Anticipated residues were calculated using either PDP monitoring data or field trial data. Both data sets are consistent in that they show essentially all non-detectable residues, with the

same limit of detection (0.01 ppm). In addition, estimates of percent crop treated (% CT) generated by EPA's Biologic and Economic Analysis Division (BEAD) should be used to refine the assessment (See attached memorandum and e-mail from J. Alsadek, 6/4/01 and 7/9/01).

Risk estimates were generated for chronic (longer-term) and cancer dietary exposure using the most recent version of the Dietary Exposure Evaluation Model (DEEM™, Version 7.73), and toxicological doses and endpoints selected by the HED Hazard Identification Assessment Review Committee (HIARC) for oxyfluorfen risk assessments. The committee did not select an acute dietary endpoint for oxyfluorfen.

Executive Summary

Refined chronic dietary exposure estimates are provided in this document and its attachments. This dietary risk assessment indicates that chronic dietary risk estimates oxyfluorfen are *below* HED's *level of concern* (<100% RfD) for the U.S. population and all population subgroups based mainly on non-detects from PDP monitoring data and field trials.

Table 1. Chronic Dietary Exposure Summary for Oxyfluorfen

Population	Exposure (mg/kg body wt/day)	%RFD
U.S. Population	0.000005	<1
All Infants	0.000011	<1
Children (1-6 yrs)	0.000012	<1
Children (7-12 yrs)	0.000009	<1
Females (13-50 yrs)	0.000004	<1
Males (13-19 yrs)	0.000005	<1
Males (20+ yrs)	0.000004	<1
Seniors (55+ yrs)	0.000004	<1

For the cancer dietary assessment, the dietary risk estimate for the US population for oxyfluorfen was 3.8×10^{-7}. This estimate is *below* HED's *level of concern* for cancer risk.

A summary of the input parameters used in the dietary assessment are provided in Table 2 below.

Table 2. Summary of Residue Values Used in the Dietary Risk Assessment

RAC	*Anticipated Residue Value Used in the Chronic and Cancer Dietary Assessment (in ppm, includes adjustment for percent crop treated)*
Almonds	0.00215
Filberts	0.00015
Pecans	0.00005
Pistachio	0.0022
Walnuts	0.0014
Beechnut, Brazil nut, Butternut, Cashews, Chest nuts, Chinquapin, Hickory nut, Macadamia nut	0.0022
Artichokes	0.00265
Avocados	0.00015
Bananas (including plantain)	0.001
Broccoli	0.0005
Cabbage (and Bok choy)	0.0003
Cauliflower	0.0013
Cattle, fat	0.000012
Cattle, mbyp	0.000002
Cattle, meat	0.000002
Cacao beans	0.05
Coffee	0.005
Corn, grain	0.00005
Corn Processed Fractions	0.00125
Cottonseed	0.00005
Cottonseed Oil	0.000165
Dates	0.00005
Eggs	0.000014
Figs	0.00165
Garlic	0.00145
Goat, fat	0.000012
Goat, mbyp	0.000002

RAC	*Anticipated Residue Value Used in the Chronic and Cancer Dietary Assessment (in ppm, includes adjustment for percent crop treated)*
Goat, meat	0.000002
Table Grapes	0.00175
Wine Grapes	0.0027
Grapes (Raisins)	0.0003
Hogs, fat	0.000012
Hogs, mbyp	0.000002
Hogs, meat	0.000002
Horseradish	0.00005
Horses, fat	0.000012
Horses, mbyp	0.000002
Horses, meat	0.000002
Kiwifruit	0.00045
Olives	0.00065
Olive Oil	0.00065
Onions (dry bulb)	0.00145
Milk	0.000002
Mint hay (Peppermint and Spearmint)	0.0009
Mint Oil (Peppermint and Spearmint)	0.00216
Persimmons	0.00005
Apple	0.00015
Pear	0.00035
Crabapples, Loquat, Mayhaws and Quinces	0.00035
Pomegranates	0.0013
Poultry, fat (including chickens and turkeys)	0.00009
Poultry, mbyp (including chickens and turkeys)	0.000003
Poultry, meat (including chickens and turkeys)	0.000002
Sheep, fat	0.000012
Sheep, mbyp	0.000002

RAC	*Anticipated Residue Value Used in the Chronic and Cancer Dietary Assessment (in ppm, includes adjustment for percent crop treated)*
Sheep, meat	0.000002
Soybean Seed	0.00005
Soybean Oil	0.00025
Cherries (sweet)	0.00045
Cherries (tart)	0.0001
Peaches	0.0007
Plums/Prunes	0.0012
Nectarines	0.00175
Apricots	0.0005
Strawberries	0.00005
Blackberry	0.0009
Garbanzo beans	0.00005
Guava	0.00005
Papaya	0.00005
Rabbit	0.000002
Raspberry	0.0014
Taro (corms and leaves)	0.00005

Toxicological Information

The HED Hazard Identification Assessment Review Committee met 3/15/01 to select doses and endpoints for the human health risk assessment for oxyfluorfen [K. Farwell, 4/23/01]. The FQPA Safety Factor Committee met on 4/9/01 to evaluate both the hazard and exposure databases and recommended that the **10x FQPA Safety Factor for oxyfluorfen be removed (1X).** A summary of the doses and endpoints relevant to dietary exposure assessment are presented in Table 3.

Table 3.Summary of Doses/Endpoints for Dietary Risk Assessment for Oxyfluorfen.

EXPOSURE SCENARIO	DOSE (mg/kg/day)	ENDPOINT	STUDY
Acute Dietary	**An appropriate endpoint attributed to a single dose was not available. Therefore, an acute RfD was not established.**		
Chronic Dietary	NOAEL = 3.0 UF = 100 FQPA = 1X	Liver toxicity occurring in dogs and mice.	Chronic dog study and mouse carcinogenicity
		Chronic RfD = 0.03 mg/kg/day	
Cancer	**Q_1* = 7.32 x 10^{-2} $(mg/kg/day)^{-1}$**	Combined hepatocellular adenomas and carcinomas.	Mouse carcinogenicity study

Consumption Data

HED conducts dietary risk assessments using the Dietary Exposure Evaluation Model (DEEM™, Version 7.73) and consumption data generated in USDA's Continuing Surveys of Food Intake by Individuals (CSFII), 1989-1992. These surveys were conducted during three consecutive days of consumption for over 10,000 individuals, resulting in more than 30,000 monitored eating events.

For chronic dietary risk assessments, the three-day average of consumption for each sub-population is combined with residues in commodities to determine average exposure in mg/kg/day.

Residue Information

Monitoring data for oxyfluorfen have been generated in numerous commodities through the USDA Pesticide Data Program (PDP) from 1996 to 1999 (total of 3,720 samples analyzed). These data have been generated for the following crops: apple juice, apples, carrots, grapes, green beans (canned and fresh), high fructose corn syrup, oranges, peaches, spinach (fresh and canned), sweet corn, sweet peas, tomatoes (fresh and canned), sweet potatoes, orange juice, pears, winter squash (fresh and canned), cantaloupe, grape juice, strawberries (fresh and frozen) and sweet bell peppers. There were no residues detected on these commodities. The PDP

monitoring data were consistent with field trial data (discussed below) in that in general all residues were non-detectable at an LOD of 0.01 ppm.

The majority of oxyfluorfen tolerances for plant commodities are established at 0.05 ppm. Most of the Craven replacement residue data indicate that residues of oxyfluorfen *per se* in/on many crop commodities are <0.01 ppm (nondetectable) and suggest that tolerances could be lowered. However, because of concerns regarding setting a tolerance level at the LOQ of the data-collection method, the possibility of an occasional residue of oxyfluorfen >0.01 ppm, and the registrant's intention to propose a new single analyte enforcement method (GC/ECD method designated as Method TR-34-95-111) for oxyfluorfen with a quantitation limit of 0.02 ppm, the Agency recommends for maintaining the existing tolerances at 0.05 ppm (DP Barcode D225680, 6/18/96, C. Eiden). HED may reassess tolerances again pending the outcome of the requested Agency petition method validation for Method TR-34-95-111.

Most of the residue values entered in the current analysis are estimates based on nondetectable residues in PDP monitoring and/or field trials conducted at the maximum use rate. HED will assume that residues are present on these commodities at a level of ½LOQ (0.005 ppm). These values were adjusted using the percent crop treated information from BEAD.

The residue inputs for chronic and cancer dietary risk assessment are detailed in the following discussion. The residues values used in the assessment were determined using the following equation: ½LOQ (0.005 ppm)*%CT. It should be noted that the detectable residue values found in field trials were found at exaggerated rates only.

Root and Tuber Vegetables Group

Horseradish

Adequate field trial data are available for horseradish. IR-4 data (MRID 43973701) indicate that residues of oxyfluorfen were <0.01 ppm (nondetectable) in/on horseradish roots harvested at maturity (141 to 144 days) following a single preemergence broadcast application of the 1.6 lb/gal EC formulation at 0.5 lb ai/A (1x the maximum single application rate). The percent crop treated from BEAD is 1%. A value of 0.00005 ppm was used in the assessment.

Taro corm

Adequate field trial data are available for taro corm. Residue data (MRID 40940301) reported in petition review PP#9E3716 (5/4/89, M. Nelson) indicate that residues of oxyfluorfen were <0.02 ppm (nondetectable) in/on taro leaves and corms harvested 186-187 days (approximately 6 months) following the last of two applications of the 1.6 lb/gal EC formulation at 0.25, 0.5, or 1.0 lb ai/A/application (0.5x, 1x, or 2x the maximum single and seasonal rates, respectively). The first application was made as a broadcast treatment one week after transplanting, and the second as a directed spray approximately three months later. The percent crop treated from BEAD is 1%. A value of 0.00005 ppm was used in the assessment.

Leaves of Root and Tuber Vegetables Group

Taro foliage

Adequate field trial data are available for taro foliage. These data were submitted in conjunction with the taro corm data; details of the study are presented above in the "Root and Tuber Vegetables" section. The percent crop treated from BEAD is 1%. A value of 0.00005 ppm was used in the assessment.

Bulb Vegetables Group

Garlic

No additional residue data for garlic are required. Registered use patterns for garlic are supported by adequate residue data for dry bulb onion (MRID 43965501). In accordance with 40 CFR §180.1, a separate tolerance for garlic is not needed because the established tolerance for dry bulb onions will apply to garlic. HED will translate the percent crop treated data from dry onions to garlic. The percent crop treated from BEAD is 29%. A value of 0.00145 ppm was used in the assessment.

Onion, dry bulb

Adequate field trial data are available for dry bulb onions. The reviewed Craven replacement data (MRID 43965501) indicate that residues of oxyfluorfen were <0.01 ppm (nondetectable) in/on samples of dry bulb onions harvested 45-54 days following the last of two postemergence broadcast spray applications of the 1.6 lb/gal EC formulation at 0.5 lb ai/A (1x the maximum single and seasonal rates). The percent crop treated from BEAD is 29%. A value of 0.00145 ppm was used in the assessment.

Brassica Leafy Vegetables Group

Broccoli

No additional residue data for broccoli are required. The available Craven replacement data for cabbage (MRID 43986301) and cauliflower (MRID 43986302) were translated to broccoli since the registered uses of oxyfluorfen on these Brassica leafy vegetables are identical. The percent crop treated from BEAD is 10%. A value of 0.0005 ppm was used in the assessment.

Cabbage

Adequate field trial data are available for cabbage. The reviewed Craven replacement data (MRID 43986301) indicate that residues of oxyfluorfen were <0.01 ppm (nondetectable) in/on samples of cabbage with and without wrapper leaves harvested at maturity following a

single pre-transplant broadcast application to the soil of the 1.6 lb/gal EC formulation at 0.5 lb ai/A (1x the maximum single and seasonal rates). The percent crop treated from BEAD is 6%. A value of 0.0003 ppm was used in the assessment. This value was also used for bok choy.

Cauliflower

Adequate field trial data are available for cauliflower. The reviewed Craven replacement data (MRID 43986302) indicate that residues of oxyfluorfen were <0.01 ppm (nondetectable) in/on samples of cauliflower heads harvested at maturity (number of days unspecified) following a single pre-transplant broadcast application to the soil of the 1.6 lb/gal EC formulation at 1x the maximum registered rate. The percent crop treated from BEAD is 26%. A value of 0.0013 ppm was used in the assessment.

Legume Vegetables (Succulent or Dried) Group

Chickpea (garbanzo bean)

Adequate field trial data are available for garbanzo beans. Residue data (MRID 41622701) reported in petition PP#0E3908 (3/21/91, M. Nelson) indicate that residues of oxyfluorfen were <0.02 ppm (nondetectable) in/on samples of garbanzo beans harvested 119 days following a single preemergence application of the 1.6 lb/gal EC formulation at 0.125, 0.25, or 0.5 lb ai/A (0.5x, 1x, or 2x the maximum single rate, respectively). In another study, (PP#8F2058; 2/13/79, R. Perfetti), residues were <0.01-0.02 ppm in/on soybeans harvested 118-165 days following a single preemergence application of an unspecified formulation at 0.12-1.75 lb ai/A (0.5x-7x). The percent crop treated from BEAD is 1%. A value of 0.00005 ppm was used in the assessment.

Soybean seed

Adequate field trial data are available for soybean seed. The Oxyfluorfen Phase 4 Review reported that analysis of >200 samples of treated soybean seeds showed only 10 samples with residues ≥0.01 ppm ranging from 0.01 to 0.02 ppm (MRIDs 00125632, 000136873, 92136053, and 92136086). Field trial data, submitted in conjunction with a soybean processing study (MRID 43764901), indicate that residues of oxyfluorfen were <0.01 ppm (nondetectable) in/on soybean seed samples harvested 136 days following a single preemergence application of the 1.6 lb/gal EC formulation at 0.5 or 2.5 lb ai/A (1x or 5x the maximum preemergence application rate, respectively). The percent crop treated from BEAD is 1%. A value of 0.00005 ppm was used in the assessment for soybean seed.

Pome Fruits Group

Adequate field trial data, reflecting the maximum registered use pattern of oxyfluorfen on apples and pears, the representative commodities of the pome fruits crop group, are available.

Apple

Residue data from PDP (1996) for apples showed that there were a total of 89 samples analyzed with non-detectable residues. Residue data from PDP (1996, 1997, 1998) for apple juice showed that there were a total of 239 analyzed with non-detectable residues. The reviewed Craven replacement data (MRID 43794001) indicate that residues of oxyfluorfen were <0.01 ppm (nondetectable) in/on samples of apples harvested 155-197 days following a single directed spray application of the 1.6 lb/gal EC formulation at 2.0 lb ai/A (1x the maximum single and seasonal rates). The percent crop treated from BEAD is 3%. A value of 0.00015 ppm was used in the assessment.

Pear

Residue data from PDP (1997, 1998) for pears showed that there were a total of 216 samples analyzed with non-detectable residues. The reviewed Craven replacement data (MRID 44575901) indicate that residues of oxyfluorfen *per se* were less that the LOD (<0.003 ppm) in/on pears harvested 127 days following a single dormant application of the 1.6 lb/gal EC formulation at 2.0 lb ai/A (1x the maximum single and seasonal rates). The percent crop treated from BEAD is 7%. A value of 0.00035 ppm was used in the assessment.

BEAD did not provide percent crop treated information for other members of the pome fruit group (crabapples, loquat, mayhaws and quince). HED has assigned the value used for pears to these racs since this commodity has the highest percent crop treated.

Stone Fruits Group

Adequate field trial data, reflecting the maximum registered use pattern of oxyfluorfen on cherries, peaches, and plums, the representative commodities of the stone fruits crop group, are available.

Cherry

The reviewed Craven replacement data (MRID 43794008) indicate that residues of oxyfluorfen were <0.01 ppm (nondetectable) in/on cherries harvested 100 days following a single directed spray application of the 1.6 lb/gal EC formulation at 2.0 lb ai/A (1x the maximum single and seasonal rates). The percent crop treated from BEAD is 9% for sweet cherries. An average value of 0.00045 ppm was used in the assessment for sweet cherries. The percent crop treated from BEAD is 2% for tart cherries. A value of 0.0001 ppm was used in the assessment for tart cherries.

Peaches

Residue data from PDP (1996, 1997) for peaches showed that there were a total of 167 samples analyzed with non-detectable residues. The reviewed Craven replacement data (MRID

44025401) indicate that residues of oxyfluorfen were <0.01 ppm (nondetectable) in/on samples of peaches harvested 90 or 134 days following a single dormant application of the 1.6 lb/gal EC formulation at 2.0 lb ai/A (1x the maximum single and seasonal rates). The percent crop treated from BEAD is 14%. A value of 0.0007 ppm was used in the assessment.

Plums/Prunes

The plum field trials (MRIDs 00036708, 00079475, 00110745, 00146340, 92136054, and 92136087) reported in the Oxyfluorfen Phase 4 Review indicate that analysis of 26 treated plum samples showed only 3 samples with residues of oxyfluorfen at 0.01 ppm; residues in the remaining 23 samples were <0.01 ppm (nondetectable). The percent crop treated from BEAD is 24%. A value of 0.0012 ppm was used in the assessment.

Nectarines

Residue data were translated from peaches. The percent crop treated from BEAD is 35%. A value of 0.00175 ppm was used in the assessment.

Apricots

Residue data were translated from peaches. The percent crop treated from BEAD is 10%. A value of 0.0005 ppm was used in the assessment.

Berries Group

Blackberries

Adequate field trial data are available for blackberries. Data (MRID 43424201) submitted by IR-4 indicate that residues of oxyfluorfen were <0.05 ppm (nondetectable) in/on samples of blackberries harvested 14 or 37 days following the last of five or six applications of a representative EC formulation at 2.0 lb ai/A/application for a total rate of 10 or 12 lb ai/A (5x and 6x the maximum seasonal rate, respectively). The percent crop treated from BEAD is 18%. A value of 0.0009 ppm was used in the assessment.

Raspberries

Adequate field trial data are available for raspberries. Data (MRID 43424202) submitted by IR-4 indicate that residues of oxyfluorfen were <0.05 ppm (nondetectable) in/on samples of raspberries harvested 51 or 63 days following the last of two applications of a representative EC formulation at 2.0 lb ai/A/application for a total rate of 4.0 lb ai/A (3.3x the maximum seasonal rate). Data (MRID 43424203) from an additional raspberry field trial indicate that residues of oxyfluorfen were <0.01 ppm (nondetectable) in/on raspberries harvested 42 days following the last of two applications of an EC formulation at 1.0 or 2.0 lb ai/A/application for a total rate of

2.0 or 4.0 lb ai/A (1.7 or 3.3x the maximum seasonal rate, respectively). The percent crop treated from BEAD is 28%. A value of 0.0014 ppm was used in the assessment.

Tree Nuts Group (except Almond Hulls)

Adequate non-Craven field trial data, reflecting the maximum registered dormant use pattern of oxyfluorfen on almonds, pecans, and walnuts are available to support the established oxyfluorfen tolerance for the tree nuts group. Adequate field trial data are also available to support non-dormant uses of oxyfluorfen on macadamia nuts grown in HI.

The Oxyfluorfen Phase 4 Review (MRIDs 00071290-00071293 and 00110745) reported that residues of oxyfluorfen were <0.01 ppm (nondetectable) in/on all nutmeat samples, with the exception of three samples, harvested from 0 to 287 days following one or two applications of the 1.6 or 2.0 lb/gal EC formulation at 1.0-8.0 lb ai/A (0.5x-4x the maximum registered single and seasonal rates). Three nutmeat samples bore oxyfluorfen residues above the method's limit of quantitation (0.01 ppm): 0.02 ppm in pecan (4.0 lb ai/A (2x), 7-day PHI); 0.02 ppm in almond (4.0 lb ai/A (2x), 287-day PHI); and 0.02 ppm in almond (1.0 lb ai/A (0.5x), 271-day PHI).

Residue data for macadamia nuts, re-summarized by the Agency (DP Barcode D167778, 10/10/91, S. Funk) from PP#4F3119 and PP#7E3519, indicate that residues of oxyfluorfen were <0.05 ppm (nondetectable) in/on samples of macadamia nuts harvested 0, 7, 14, and 28 days following application of the 1.6 lb/gal EC formulation made during the active growing stage at 4.0 lb ai/A (1x the maximum seasonal rate).

The percent crop treated from BEAD is 43% for almonds. A value of 0.00215 ppm was used in the assessment. The percent crop treated from BEAD is 3% for filberts. A value of 0.00015 ppm was used in the assessment. The percent crop treated from BEAD is 1% for pecans. A value of 0.00005 ppm was used in the assessment. The percent crop treated from BEAD is 44% for pistachio. A value of 0.0022 ppm was used in the assessment. The percent crop treated from BEAD is 28% for walnuts. A value of 0.0014 ppm was used in the assessment. HED will translate the data from pistachio to the other members of this crop group (beech nut, brazil nut, butter nut, cashews, chest nuts, chinquapin, hickory nut, macadamia nut) since BEAD did not provided percent crop treated data for these and because pistachio has the highest percent crop treated of the group.

Almond hulls

The Oxyfluorfen Phase 4 Review (MRIDs 00071290-00071293 and 00110745) reported that residues of oxyfluorfen ranged from <0.01 ppm (nondetectable) to 0.09 ppm in/on samples of almond hulls harvested from 0 to 287 days following one or two applications of the 1.6 or 2.0 lb/gal EC formulation at 1.0-8.0 lb ai/A (0.5x-4x the maximum registered single and seasonal rates). For anticipated residues considerations (in the dietary burden calculation), a value of 0.005 ppm (½ LOQ) was used in the assessment.

Cereal Grains Group

Corn, field, grain

Field trial data, submitted in conjunction with a field corn processing study (MRID 43944801), indicate that residues of oxyfluorfen were <0.01 ppm (nondetectable) in/on samples of field corn grain harvested 60 days following the last of two applications of the 1.6 lb/gal EC formulation at 1.25 and 31.25 lb ai/A (1x or 25x the maximum application rate, respectively). The percent crop treated from BEAD is 1%. A value of 0.00005 ppm was used in the assessment.

Miscellaneous Commodities

Artichoke, globe

Adequate field trial data are available for artichokes. The reviewed Craven replacement data (MRID 43794007) indicate that residues of oxyfluorfen were <0.01 ppm (nondetectable) in/on samples of artichokes harvested 5 days following a single directed spray application of the 1.6 lb/gal EC formulation at 2.0 lb ai/A (1x the maximum single and seasonal rates). The percent crop treated from BEAD is 53%. A value of 0.00265 ppm was used in the assessment.

Avocado

Adequate field trial data are available for avocado. The reviewed Craven replacement data (MRID 43794002) indicate that residues of oxyfluorfen were <0.01 ppm (nondetectable) in/on samples of avocados harvested 241 days following a single directed spray application of the 1.6 lb/gal EC formulation at 2.0 lb ai/A (1x the maximum single and seasonal rates). The percent crop treated from BEAD is 3%. A value of 0.00015 ppm was used in the assessment.

Banana

The reregistration requirements for data depicting magnitude of the residue in bananas are not fulfilled. In addition, labels with appropriate English translation must be submitted from major banana-producing countries in Central America where oxyfluorfen is registered. As previously requested (DP Barcode D171996, 4/16/92, F. Fort), residue field trials (one in Puerto Rico and two in representative Central American countries) should be conducted, and these trials should reflect two applications of a representative EC formulation, with a 90-day retreatment interval at the maximum label rate of 0.85 lb ai/A, and samples must be harvested at the stipulated 3-day PHI. In the absence of percent crop treated data from BEAD and since more residue studies are required, HED has assigned, based on tolerance level residue, a value of 0.05 ppm for bananas and plantains. The percent crop treated from BEAD is 2%. A value of 0.001 ppm was used in the assessment.

Cacao beans

The initial Residue Chemistry Chapter for the Oxyfluorfen RED document (DP Barcodes D226225 and D228704, 9/26/96, C. Eiden) did not require additional residue data for cacao beans based on an earlier Agency decision (PP#0E3898; CB No. 7003, 9/25/90, F. Griffith) to translate the available field trial data for pome fruits, stone fruits, tree nuts, olives, dates, and kiwifruit to cacao beans. Following re-examination of registered uses, HED concludes that the registered uses of oxyfluorfen on cacao beans substantially differ from the above tree crops to allow translation of residue data. The registered uses of oxyfluorfen on pome fruits, stone fruits, tree nuts, olives, dates, and kiwifruit include applications to tree crops during dormant stages with maximum seasonal rates of 2.0 lb ai/A, and unspecified built-in PHIs. The registered uses of oxyfluorfen on cacao beans include applications during non-dormant stage with a maximum seasonal rate of 6.0 lb ai/A, and a 1-day PHI. Therefore, HED is now requiring residue data for cacao beans for reregistration purposes. In the absence of percent crop treated data from BEAD and since more residue studies are required, HED has assigned, based on tolerance level residue, a value of 0.05 ppm for cacao beans and will assume that 100% of the crop is treated.

Coffee

Adequate field trial data are available for coffee. The Oxyfluorfen Phase 4 Review (MRIDs 00102529, 92136037, and 92136073) reported that in field trials conducted in HI, residues of oxyfluorfen were <0.01 ppm (nondetectable) in/on all samples of coffee beans treated according to registered uses. Field trial data, submitted in conjunction with a coffee processing study (MRID 44172301), indicate that residues of oxyfluorfen were each <0.01 ppm (nondetectable) in/on samples of mature coffee cherries and green coffee beans harvested one day following a single directed spray application of the 1.6 lb/gal EC formulation to coffee orchard floor at 7.2 lb ai/A (1.2x the maximum seasonal application rate). There is no percent crop treated data from BEAD for coffee. Based on the fact that there were non-detectable residues in the coffee field trials, and that there are no outstanding deficiencies for coffee, HED has assigned a value of 0.005 ppm (½LOQ) to be used in the dietary assessment.

Cottonseed

Adequate field trial data, reported from two previous cotton petitions, are available for cottonseed. In conjunction with PP#8G2028/FAP#9H5199, the results of several cotton field trials were summarized in MRID 92136075. These trials indicate that residues of oxyfluorfen ranged from nondetectable (<0.01 ppm) to 0.01 ppm in/on 25 samples of cottonseed harvested 74-174 days following one post-emergence directed spray application of a representative formulation at 0.25 to 2.0 lb ai/A (0.25-2x the maximum seasonal rate); only four treated samples bore quantifiable residues of 0.01 ppm while the remaining 21 samples bore nondetectable residues (<0.01 ppm). In conjunction with PP#1F2488/FAP#1H5296, the results of 12 additional cotton trials were summarized in MRID 92136039. These trials indicate that residues of oxyfluorfen ranged from nondetectable (<0.01 ppm) to 0.01 ppm in/on 25 samples (only one sample had a value of 0.01 ppm) of cottonseed harvested 97-147 days following one

post-emergence directed spray application of a representative formulation at 0.25 to 1.0 lb ai/A (0.25-1x). The percent crop treated from BEAD is 1%. A value of 0.00005 ppm was used in the assessment.

Dates

Adequate field trial data are available for dates. Data (MRIDs 00145972, 40223205, 92136041, and 92136076) reported in the Oxyfluorfen Phase 4 Review indicate that the established tolerance will not be exceeded following application of a representative formulation according to the registered use pattern for dates. HED will allow confirmatory residue data from figs to be translated to dates. The reviewed Craven replacement fig data (MRID 43794003) indicate that residues of oxyfluorfen were <0.01 ppm (nondetectable) in/on all samples of figs harvested 206 days following a single directed spray application of the 1.6 lb/gal EC formulation made to dormant trees at 2.0 lb ai/A (1x the maximum single and seasonal rates). The percent crop treated from BEAD is 1%. A value of 0.00005 ppm was used in the assessment.

Fig

Adequate field trial data are available for fig. The reviewed Craven replacement data (MRID 43794003) indicate that residues of oxyfluorfen were <0.01 ppm (nondetectable) in/on figs harvested 206 days following a single directed spray application of the 1.6 lb/gal EC formulation made to dormant fig trees at 2.0 lb ai/A (1x the maximum single and seasonal rates). The percent crop treated from BEAD is 33%. A value of 0.00165 ppm was used in the assessment.

Grape

Residue data from PDP (1996) for grapes showed that there were a total of 89 samples analyzed with non-detectable residues. Residue data from PDP (1998) for grape juice showed that there were a total of 108 samples analyzed with non-detectable residues. Adequate field trial data are available for grape. The results of grape field trials (MRIDs 00036703, 00110745, 00146340, 92136043, and 92136078) reported in the Oxyfluorfen Phase 4 Review indicate that residues of oxyfluorfen were 0.01-0.02 ppm in/on grape samples harvested at an unspecified interval following a single application of the 2 lb/gal EC formulation at 0.25-8.0 lb ai/A (0.125-4x the maximum seasonal rate). Oxyfluorfen residues $\geq$0.01 ppm were found in only 6 of 31 samples.

Adequate data are available to support oxyfluorfen uses registered under FIFRA Section 24c for SLNs WA970024 and CA970026 (DP Barcode D239556, 10/2/97, J. Abbotts). The reviewed data (MRIDs 44385401 and MRID 44385402) indicate that residues of oxyfluorfen were <0.01 ppm (nondetectable) in/on all grape samples from the non-CA trials harvested 14-15 and 30-33 days following a single directed spray application of the 1.6 lb/gal EC formulation to the base of non-dormant vines at 1.0 or 2.0 lb ai/A (0.5 and 1x the maximum seasonal rate for this type of use). For each CA location, trials were conducted at 14, 30, and 60 day PHIs. For

one 60 day sample in one trial, residues of oxyfluorfen in/on grapes were 0.042 ppm; for all other CA samples residues were below the LOQ.

The percent crop treated from BEAD is 6% for raisins. A value of 0.0003 ppm was used in the assessment. The percent crop treated from BEAD is 35% for table grapes. A value of 0.00175 ppm was used in the assessment. The percent crop treated from BEAD is 54% for wine grapes. A value of 0.0027 ppm was used in the assessment.

Guava

Adequate field trial data are available for guava. Residue data (MRIDs 00158014, 92136044, and 92136079) submitted by IR-4 and reported in the Oxyfluorfen Phase 4 Review indicate that residues of oxyfluorfen were <0.01 ppm (nondetectable) in/on all samples harvested 1 or 7 days following the last of eight or nine applications of the 2 lb/gal EC formulation at 1.0, 2.0, and 4.0 lb ai/A for a maximum seasonal rate of 12 lb ai/A (3x maximum seasonal rate). The percent crop treated from BEAD is 1%. A value of 0.00005 ppm was used in the assessment.

Kiwifruit

Adequate field trial data are available for kiwifruit. The reviewed Craven replacement data (MRID 43794005) indicate that residues of oxyfluorfen were <0.01 ppm (nondetectable) in/on samples of kiwifruit harvested 255 days following a single directed spray application of the 1.6 lb/gal EC formulation to non-dormant vines at 2.0 lb ai/A (1x the maximum single and seasonal rates). The percent crop treated from BEAD is 9%. A value of 0.00045 ppm was used in the assessment.

Mint, tops

Adequate field trial data are available for mint tops. The mint field trial data (MRIDs 00071290, 00071291, 00071292, 00071293, 92136046, 92136047, and 92136082) reported in the Oxyfluorfen Phase 4 Review indicate that residues of oxyfluorfen ranged from <0.01 ppm (nondetectable) to 0.03 ppm in/on samples of mint hay harvested 127-182 days following a single dormant application of the 2 lb/gal EC formulation at 2.0 lb ai/A (1x the maximum application rate) or 4.0 lb ai/A (2.0x). Based on these data, the established tolerance for mint hay should be lowered from 0.1 ppm to 0.05 ppm (DP Barcode D220411, 11/1/95, S. Knizner). The percent crop treated from BEAD is 18%. A value of 0.0009 ppm was used in the assessment.

Olive

Adequate field trial data are available for olive. The reviewed Craven replacement data (MRID 43794006) indicate that residues of oxyfluorfen were <0.01 ppm (nondetectable) in/on samples of olives harvested 222 days following a single directed spray application of the 1.6 lb/gal EC formulation to non-dormant olive trees at 2.0 lb ai/A (1x the maximum single and

seasonal rates). The percent crop treated from BEAD is 13%. A value of 0.00065 ppm was used in the assessment for olives and olive oil.

Papaya

Adequate field trial data are available for papaya. Data (MRID 40783201) reported in the original papaya petition review (PP#8E3677, 9/22/88, M. Nelson) indicate that residues of oxyfluorfen were <0.01 ppm (nondetectable) in/on all samples of papaya fruits harvested 1-7 days following the last of three applications of the 1.6 lb/gal EC formulation at 0.5, 1.0, 2.0, or 4.0 lb ai/A/application (0.5x, 1x, 2x, or 4x the maximum single and seasonal rates, respectively). The percent crop treated from BEAD is 1%. A value of 0.00005 ppm was used in the assessment.

Persimmon

No additional persimmon field trial data are required for reregistration. The available field trial data for tree fruit and nut crops will be translated to persimmons since the registered uses of these crops are similar to persimmon (PP#9E3718; CB No. 4837, 4/14/89, M. Nelson). The percent crop treated from BEAD is 1%. A value of 0.00005 ppm was used in the assessment.

Pomegranate

Adequate field trial data are available for pomegranate. The reviewed Craven replacement data (MRID 43794004) indicate that residues of oxyfluorfen were <0.01 ppm (nondetectable) in/on samples of pomegranates harvested 241 days following a single directed spray application of the 1.6 lb/gal EC formulation to dormant pomegranate trees at 2.0 lb ai/A (1x the maximum single and seasonal rates). The percent crop treated from BEAD is 26%. A value of 0.0013 ppm was used in the assessment.

Strawberries

Adequate field trial data are available to support oxyfluorfen use on strawberries under FIFRA Section 18. Data (Project PR-3443, No MRID assigned) submitted by IR-4 (DP Barcode D203459, 5/23/94, M. Nelson) in support of this Section 18 emergency exemption indicate that residues of oxyfluorfen were <0.01 ppm (nondetectable) in/on all samples of strawberries harvested 123 or 201 days following the last of one or two applications of the 1.6 lb/gal EC formulation at 0.5 or 1.0 lb ai/A/application for a maximum seasonal rate of 2.0 lb ai/A (4x the maximum seasonal rate). Based on these data (exaggerated rates and nonquantifiable residues), the established time-limited tolerance for strawberries is reassessed at its existing level of 0.05 ppm. IR-4 is in the process of submitting a Section 3 request for establishment of permanent tolerances in strawberries. This tolerance will be reassessed again pending the outcome of the full petition review by HED. The percent crop treated from BEAD is 1%. A value of 0.00005 ppm was used in the assessment.

Grass Grown for Seed

Residue data in support of a regional registration request for use of oxyfluorfen on grass grown for seed in the states of OR and WA (under IR-4 and the Agricultural Experiment Station of Oregon) were originally submitted under PP#3E4175. Residues of oxyfluorfen *per se* were nondetectable (<0.03 ppm) in/on all samples of grass forage, hay, straw, and seed screenings harvested 123-154 days following a single postemergence over the top application of the 1.6 lb/gal EC formulation made either early in the growing season or later in the growing season at 0.375 lb ai/A (1x the maximum proposed seasonal rate). HED concludes that the reassessed animal commodity tolerances are adequate to cover any residue contribution from proposed uses of oxyfluorfen on grasses grown for seed. Also, there are no poultry feed commodities associated with this petition. HED has concluded that there are no residue chemistry data requirements that would preclude the establishment of tolerances with regional registration for residues of oxyfluorfen *per se* in/on grass forage, hay, straw, and seed screening at 0.05 ppm each. Although PP#3E4175 was in reject status (J. Morales, 5/19/93, D185362), IR-4 has recently submitted additional residue data to support the petition. These data are currently under review. The preliminary conclusions of this review support the establishment of a 0.05 ppm tolerance (J. Morales, D275124).

GLN 860.1520: Processed Food/Feed

Adequate processing studies are available for apples, coffee, corn (field), cottonseed, mint, and soybeans. These studies suggest that residues of oxyfluorfen do not concentrate (or do not concentrate significantly) to warrant the establishment of oxyfluorfen tolerances in the processed food/feed commodities of the above crops. HED notes that tolerances for cottonseed oil, mint oil, and soybean oil that were previously established under 40 CFR §185.4600 have been revoked. The default DEEM concentration factors were used for this dietary assessment.

The processing data requirements for figs, grapes, olives, and plums are waived based on the results of translocation/metabolism studies which indicate that oxyfluorfen is not taken up by plants. A summary of the available processing data, arranged alphabetically by crop, is presented below.

Apple (wet pomace and juice)

An adequate apple processing study is available. The Oxyfluorfen Phase 4 review reported the results of a processing study (MRID 00141092) wherein residues of oxyfluorfen did not concentrate in juice (cider) and wet pomace (wet cake) but concentrated 12x in dry pomace (wet cake) following processing of apples bearing detectable oxyfluorfen residues (0.02 and 0.04 ppm). The previous Agency recommendation to propose a tolerance for dry pomace based on the observed concentration factor of 12x is no longer required because dry pomace has been removed from Table 1 as a significant livestock feed item.

Coffee (roasted instant bean)

An adequate coffee processing study, submitted by IR-4, is available. This study (MRID 44172301) indicates that residues of oxyfluorfen were less than the analytical method's LOQ (<0.01 ppm) in/on mature coffee cherries and green coffee beans harvested 1 day following a single directed spray application of the 1.6 lb/gal EC formulation to coffee orchard floor at 7.2 lb ai/A (1.2x the maximum seasonal rate). The 1.2x rate is equivalent to the maximum theoretical concentration factor for roasted coffee based on separation into components (Table 3, OPPTS 860.1520), and is an adequate exaggerated rate for the coffee processing study. Because oxyfluorfen residues were below the LOQ in/on coffee beans treated at 1.2x, processing data on roasted coffee beans are not required. The Agency (CB No. 12194, DP Barcode D193009, 8/31/93, S. Funk) has previously waived the data requirements for processed instant coffee.

Corn, field (wet milling: starch and refined oil; dry milling: meal, grits, flour, and refined oil)

In 1999 PDP analyzed 156 samples of high fructose corn syrup. Non-detectable residues were found in all the samples analyzed. Field residue data (MRID 43944801) indicate that residues of oxyfluorfen were <0.01 ppm (nondetectable) in/on samples of field corn grain treated with the 1.6 lb/gal EC formulation at application rates of 1x and 25x rates. The maximum theoretical concentration factor for corn processed commodities is 25x. The requirement for a corn processing study is, therefore, waived because nondetectable residues resulted from field tests conducted at a rate equivalent to the maximum theoretical concentration factor. Tolerances for field corn processed commodities are not required. Applying this theoretical concentration factor to the corn anticipated residue (0.00005 ppm) will give a value of 0.00125 ppm for corn processed commodities.

Cottonseed (meal, hulls, and refined oil)

Adequate cotton processing studies are available. The results of two cotton processing studies (MRID 92136040) were initially reported in conjunction with PP#1F2488/FAP#1H5296 (10/9/81, M.J. Nelson) and subsequently re-evaluated (DP Barcode D220411, 11/95, S. Knizner) as part of the evolving Agency policy on processed foods. Residues of oxyfluorfen did not concentrate in meal but concentrated 2.5x and 4x in crude oil. The available residue data for cottonseed (the RAC) indicate that the highest average field trial (HAFT) residue is 0.01 ppm. Based on this HAFT value and the average concentration factor of 3.3x for cottonseed oil, the maximum expected residues of oxyfluorfen in cottonseed oil are 0.033 ppm which is lower than the reassessed tolerance of 0.05 ppm for cottonseed. Therefore, the registrant does not need to propose a tolerance for cottonseed oil; any finite residues expected in refined cottonseed oil resulting from application of oxyfluorfen according to registered uses can be adequately covered by the reassessed RAC tolerance. Applying this theoretical concentration factor to the soybean anticipated residue (0.00005 ppm) will give a value of 0.000165 ppm for cottonseed oil.

Figs (dried figs), Grapes (raisin and juice), Olives (oil), and Plums (prune)

Although processing studies on figs, grapes, olives, and plums are not available, these studies are not required for reregistration. In a meeting with Rohm and Haas to discuss Phase 4 Reregistration Review of Oxyfluorfen (12/31/91 memo by S. Funk, no DP Barcode), the Agency agreed to reserve the processing data requirements for these crops pending an evaluation of the requested translocation/metabolism studies. The results of translocation/metabolism studies conducted at exaggerated rates (5x) on tomatoes, onions, and peaches suggest that oxyfluorfen is not taken up by plants. Furthermore, data depicting magnitude of the residue in/on the RACs of figs, grapes, olives, and plums following treatment at registered and exaggerated rates, suggest that residues were mostly nondetectable (<0.01 ppm). Therefore, the processing data requirements for these crops are waived.

Mint (oil)

Adequate mint (peppermint and spearmint) processing studies are available. The results of several mint processing studies (MRID 92136046) were initially reported in conjunction with PP#1F2488/FAP#1H5296 (10/9/81, M.J. Nelson) and subsequently re-evaluated (DP Barcode D220411, 11/95, S. Knizner). Residues of oxyfluorfen concentrated at an average factor of 2.4x in mint oil. Based on the HAFT residue of 0.03 ppm and an average concentration factor of 2.4x, the maximum expected residues in mint oil are calculated as 0.072 ppm. The residue level for mint oil is not appreciably higher than the reassessed RAC tolerances of 0.05 ppm. Therefore, a food additive tolerance for mint oil is not required. Applying this theoretical concentration factor to the mint hay anticipated residue (0.0009 ppm) will give a value of 0.00216 ppm for peppermint and spearmint oil.

Soybean (meal, hulls, and refined oil)

An adequate soybean processing study is available. The results of this study (MRID 43764901) indicate that residues of oxyfluorfen were nondetectable (<0.01 ppm) in/on soybean seeds harvested 136 days following a single preemergence application of the 1.6 lb/gal EC formulation at 1x or 5x the maximum label rate. Soybeans (dry seed) contain 20% oil by weight, resulting in a maximum concentration factor of 5x for oil. Because non-quantifiable residues were found in/on dry soybean seeds following treatment at a rate equal to the maximum theoretical concentration factor, the RAC samples were not processed further. Based on this study, tolerances for soybean meal, hulls, and refined oil are not warranted. Applying this theoretical concentration factor to the soybean anticipated residue (0.00005 ppm) will give a value of 0.00025 ppm for soybean oil.

Meat, Milk and Eggs

The potential for secondary transfer of oxyfluorfen residues to animal commodities exists because the herbicide is registered for use on a variety of livestock feed commodities. The maximum theoretical dietary burdens of oxyfluorfen to beef cattle, dairy cattle, and poultry are calculated in the table below. Only livestock feed items which are currently eligible for reregistration are included in the dietary burden calculation.

Table 4. Calculation of maximum dietary burdens of oxyfluorfen to livestock and poultry.

Feed Commodity	% Dry Matter[1]	% Diet[1]	Anticipated Residue Level (ppm)	Dietary Contribution (ppm)[2]
Beef Cattle				
Almond hulls	90	10	0.005	0.00055
Soybean seed	89	10	0.00005	0.000006
Corn grain and meal	88	80	0.00005	0.00005
TOTAL BURDEN		100		**0.00061**
Dairy Cattle				
Almond hulls	90	10	0.005	0.00055
Soybean seed	89	15	0.00005	0.000008
Corn grain and meal	88	40	0.00005	0.000023
TOTAL BURDEN		65		**0.00058**
Poultry				
Corn grain and meal	--	80	0.00005	0.00004
Soybean seed	--	20	0.00005	0.00001
TOTAL BURDEN		100		**0.00005**

[1] Table 1 (OPPTS Guideline 860.1000).

[2] Contribution = [tolerance ÷ %DM] X %diet).

Based on this information, and based on the residues found in meat, meat by-products, fat and milk in the ruminant feeding study at the 13X level (Table 5), the anticipated residues in livestock commodities to be used in the chronic dietary risk assessments are shown below:

meat	0.000002 ppm
meat by-products	0.000002 ppm
fat	0.000012 ppm
milk	0.000002 ppm

Table 5. Residues of oxyfluorfen and its isomers in milk and tissues of lactating cows dosed at 0.278 ppm (4x), 0.834 ppm (13x), and 2.78 ppm (43x) oxyfluorfen for 28 days.

Matrix	Dose Level (ppm)		
	0.278	**0.834**	**2.78**
	---------- Total Residue (ppm) [a] ----------		
Milk [b]	<0.003	<0.003	<0.003-0.009
Liver [c]	<0.003	<0.003	<0.003
Fat [c]	<0.003-0.007	0.009-0.016	0.075-0.102
Muscle [c]	<0.003	<0.003	<0.003-0.011
Kidney [c]	<0.003	<0.003	0.003-0.006

[a] Total residue is the sum of oxyfluorfen (RH-2915) and its three isomers RH-0671, RH-2382, and RH-4672. Results were not corrected for method recoveries. [b] Results represent analyses of quadruplicate milk samples collected from test days 1, 4, 7, 10, 14, 17, 21, 24, and 28. [c] Quadruplicate samples (day-28) of each tissue were analyzed.

Based on the information provided above, and based on the residues found in meat, liver, eggs, and fat in the poultry metabolism study at the 2X level (Table 6), the anticipated residues (oxyfluorfen, *per se*) in poultry commodities to be used in the chronic dietary risk assessments are shown below:

meat	0.000002 ppm
eggs	0.000014 ppm
meat by-products	0.000003 ppm
fat	0.00009 ppm

Table 6. Uncorrected residues of oxyfluorfen and its isomers in eggs and tissues of laying hens dosed at 0.086 ppm (2x), 0.345 ppm (7x), and 1.21 ppm (24x) oxyfluorfen for 28 days.

Matrix	RH-0671	RH-2382	RH-4672	Oxyfluorfen
		Residues in 2x Dose Group (ppm)		
Eggs [a]	<0.003	<0.003	<0.003	<0.003-0.024
Liver [b]	0.004-0.005	<0.003-0.012	<0.003	<0.003-0.006
Fat [b]	<0.003	<0.003	<0.003	0.084-0.163
Muscle [b]	<0.003	<0.003	<0.003	<0.003-0.004
		Residues in 7x Dose Group (ppm)		
	RH-0671	**RH-2382**	**RH-4672**	**Oxyfluorfen**
Eggs	<0.003	<0.003	<0.003	<0.003-0.057
Liver	<0.003	<0.003	<0.003	0.018-0.025
Fat	<0.003	0.008-0.009	<0.003	0.487-0.620
Muscle	<0.003	<0.003	<0.003	0.011-0.022
		Residues in 24x Dose Group (ppm)		
	RH-0671	**RH-2382**	**RH-4672**	**Oxyfluorfen**
Egg	<0.003	<0.003-0.213	<0.003	<0.003-0.217
Liver	0.003-0.005	<0.003	<0.003	0.049-0.066
Fat	<0.003	0.025-0.031	0.007-0.009	1.35-1.73
Muscle	<0.003	<0.003	<0.003	0.047-0.055

[a] Results represent analyses of triplicate egg samples collected on days 1, 3, 7, 10, 14, 17, 21, and 28.
[b] Triplicate samples (day-28) of each tissue were analyzed.

Uncertainties of Dietary Exposure Estimates

This Tier 2/3 dietary risk assessment is the most refined to date for oxyfluorfen. However, there are some uncertainties associated with this exposure estimate as follows:

(a) The use of ½ LOQs instead of ½ LODs for field trial residue values. This will tend to overestimate the residue values from the field trial studies (all of the field trial studies were non-detects). Therefore, this assessment is an upper bound. The real residues are somewhere between this estimate and zero.

(b) No cooking studies were used.

(c) Use of tolerance level residues for bananas and cacao beans and 100% crop treated for cacao beans.

(d) DEEM default processing factors were used in the assessment.

Results/Discussion

This chronic dietary risk assessment indicates that dietary risk estimates for oxyfluorfen are *below* HED's *level of concern* (<100% RfD) for the U.S. population and all population subgroups (all of them were <1% of the chronic RfD).

Table 7. Chronic Dietary Exposure Summary for Oxyfluorfen

Population	Exposure (mg/kg body wt/day)	%RFD
U.S. Population	0.000005	<1
All Infants	0.000011	<1
Children (1-6 yrs)	0.000012	<1
Children (7-12 yrs)	0.000009	<1
Females (13-50 yrs)	0.000004	<1
Males (13-19 yrs)	0.000005	<1
Males (20+ yrs)	0.000004	<1
Seniors (55+ yrs)	0.000004	<1

For the cancer dietary assessment, the dietary risk estimate for the US population for oxyfluorfen was 3.8×10^{-7} [the cancer risk was estimated in the following way: dietary exposure$*Q_1^* = 0.000005$ (mg/kg/day)$*0.0732$ (mg/kg/day)$^{-1} = 3.8 \times 10^{-7}$]. This estimate is *below* HED's *level of concern* for cancer risk.

As noted under uncertainties, essentially all PDP monitoring data and field trial data indicate non-detectable residues. Thus, these risk estimates are upper bound estimates with the lower bound estimate essentially being zero.

List of Attachments:
Attachment 1: Chronic Residue Input Data for DEEM Analysis for Oxyfluorfen
Attachment 2: Chronic Residue Analysis for Oxyfluorfen
Attachment 3: Cancer Analysis for Oxyfluorfen
Attachment 4: EPA Quantitative Usage Analysis of Oxyfluorfen (J.Alsadek, 6/4/01)

Attachment 1: Chronic Residue Input Data for DEEM Analysis for Oxyfluorfen

U.S. Environmental Protection Agency Ver. 7.73
DEEM Chronic analysis for OXYFLUORFEN 1989-92 data
Residue file: C:\My DEEM\Oxyfluorfen\111601c1.RS7 Adjust. #2 used
Analysis Date 07-10-2001 Residue file dated: 07-10-2001/12:30:45/8
Reference dose (RfD) = 0.03 mg/kg bw/day
Comment:RED Chapter Run

Food Code	Crop Grp	Food Name	RESIDUE (ppm)	Adj.Factors #1	#2
1	13A	Blackberries	0.000900	1.000	1.000
5	13A	Raspberries	0.001400	1.000	1.000
13	O	Grapes	0.001750	1.000	1.000
14	O	Grapes-raisins	0.000300	1.000	1.000
15	O	Grapes-juice	0.001750	1.000	1.000
17	O	Strawberries	0.000050	1.000	1.000
40	14	Almonds	0.002150	1.000	1.000
41	14	Brazil nuts	0.002200	1.000	1.000
42	14	Cashews	0.002200	1.000	1.000
43	14	Chestnuts	0.002200	1.000	1.000
44	14	Filberts (hazelnuts)	0.000150	1.000	1.000
45	14	Hickory nuts	0.002200	1.000	1.000
46	14	Macadamia nuts (bush nuts)	0.002200	1.000	1.000
47	14	Pecans	0.000050	1.000	1.000
48	14	Walnuts	0.001400	1.000	1.000
49	14	Butter nuts	0.002200	1.000	1.000
50	O	Pistachio nuts	0.002200	1.000	1.000
51	14	Beechnuts	0.002200	1.000	1.000
52	11	Apples	0.000150	1.000	1.000
53	11	Apples-dried	0.000150	8.000	1.000
54	11	Apples-juice/cider	0.000150	1.000	1.000
55	11	Crabapples	0.000350	1.000	1.000
56	11	Pears	0.000350	1.000	1.000
57	11	Pears-dried	0.000350	6.250	1.000
58	11	Quinces	0.000350	1.000	1.000
59	12	Apricots	0.000500	1.000	1.000
60	12	Apricots-dried	0.000500	6.000	1.000
61	12	Cherries			
		11-Uncooked	0.000450	1.000	1.000
		12-Cooked: NFS	0.000450	1.000	1.000

		13-Baked	0.000450	1.000	1.000
		14-Boiled	0.000450	1.000	1.000
		31-Canned: NFS	0.000100	1.000	1.000
		33-Canned: Baked	0.000100	1.000	1.000
		41-Frozen: NFS	0.000100	1.000	1.000
62	12	Cherries-dried	0.000100	4.000	1.000
63	12	Cherries-juice			
		13-Baked	0.000100	1.500	1.000
		14-Boiled	0.000100	1.500	1.000
		31-Canned: NFS	0.000100	1.500	1.000
		41-Frozen: NFS	0.000100	1.500	1.000
64	12	Nectarines	0.001750	1.000	1.000
65	12	Peaches	0.000700	1.000	1.000
66	12	Peaches-dried	0.000700	7.000	1.000
67	12	Plums (damsons)	0.001200	1.000	1.000
68	12	Plums-prunes (dried)	0.001200	1.000	1.000
69	12	Plums/prune-juice	0.001200	1.400	1.000
70	O	Avocados	0.000150	1.000	1.000
72	O	Bananas	0.001000	1.000	1.000
73	O	Bananas-dried	0.001000	3.900	1.000
77	O	Dates	0.000050	1.000	1.000
78	O	Figs	0.001650	1.000	1.000
79	O	Guava	0.000050	1.000	1.000
81	11	Loquats	0.000350	1.000	1.000
82	O	Olives	0.000650	1.000	1.000
84	O	Papayas-pulp	0.000050	1.000	1.000
85	O	Papayas-dried	0.000050	1.800	1.000
86	O	Papayas-juice	0.000050	1.500	1.000
88	O	Persimmons	0.000050	1.000	1.000
93	O	Pomegranates	0.001300	1.000	1.000
94	O	Plantains-ripe	0.050000	1.000	1.000
97	O	Kiwi fruit	0.000450	1.000	1.000
110	O	Chocolate-cocoa butter	0.050000	1.000	1.000
111	O	Chocolate	0.050000	1.000	1.000
112	O	Coffee			
		12-Cooked: NFS	0.005000	1.000	1.000
		13-Baked	0.005000	1.000	1.000
		14-Boiled	0.005000	1.000	1.000
126	1AB	Horseradish	0.000050	1.000	1.000
168	5A	Broccoli	0.000500	1.000	1.000
170	5A	Cabbage-green and red	0.000300	1.000	1.000
171	5A	Cauliflower	0.001300	1.000	1.000
181	O	Artichokes-globe	0.002650	1.000	1.000
190	2	Taro-greens	0.000050	1.000	1.000
195	O	Grapes-leaves	0.001750	1.000	1.000
201	1CD	Taro-root	0.000050	1.000	1.000
202	3	Garlic	0.001450	1.000	1.000

205	3	Onions-dry-bulb (cipollini)	0.001450	1.000	1.000
206	3	Onions-dehydrated or dried	0.001450	9.000	1.000
217	3	Shallots	0.001450	1.000	1.000
237	15	Corn/pop	0.000050	1.000	1.000
238	15	Corn/sweet	0.000050	1.000	1.000
255	6A	Soybeans-sprouted seeds	0.000050	0.330	1.000
259	6C	Beans-dry-garbanzo/chick pea	0.000050	1.000	1.000
266	15	Corn grain-endosperm	0.000050	1.000	1.000
267	15	Corn grain-bran			
		12-Cooked: NFS	0.001250	1.000	1.000
		13-Baked	0.001250	1.000	1.000
		14-Boiled	0.001250	1.000	1.000
		15-Fried	0.001250	1.000	1.000
		31-Canned: NFS	0.001250	1.000	1.000
268	15	Corn grain/sugar/hfcs	0.001250	1.500	1.000
289	15	Corn grain-oil	0.001250	1.000	1.000
290	O	Cottonseed-oil	0.000165	1.000	1.000
291	O	Cottonseed-meal	0.000050	1.000	1.000
297	6A	Soybeans-oil	0.000250	1.000	1.000
300	O	Olive oil	0.000650	1.000	1.000
303	6A	Soybean-other	0.000050	1.000	1.000
304	6A	Soybeans-mature seeds dry	0.000050	1.000	1.000
305	6A	Soybeans-flour (full fat)	0.000050	1.000	1.000
306	6A	Soybeans-flour (low fat)	0.000050	1.000	1.000
307	6A	Soybeans-flour (defatted)	0.000050	1.000	1.000
310	O	Peppermint	0.000900	1.000	1.000
311	O	Peppermint-oil	0.002160	1.000	1.000
312	O	Spearmint	0.000900	1.000	1.000
313	O	Spearmint-oil	0.002160	1.000	1.000
315	O	Grapes-wine and sherry	0.002700	1.000	1.000
318	D	Milk-nonfat solids	0.000002	1.000	1.000
319	D	Milk-fat solids	0.000002	1.000	1.000
320	D	Milk sugar (lactose)	0.000002	1.000	1.000
321	M	Beef-meat byproducts	0.000002	1.000	1.000
322	M	Beef-other organ meats	0.000002	1.000	1.000
323	M	Beef-dried	0.000002	1.920	1.000
324	M	Beef-fat w/o bones	0.000012	1.000	1.000
325	M	Beef-kidney	0.000002	1.000	1.000
326	M	Beef-liver	0.000002	1.000	1.000
327	M	Beef-lean (fat/free) w/o bones	0.000002	1.000	1.000
328	M	Goat-meat byproducts	0.000002	1.000	1.000
329	M	Goat-other organ meats	0.000002	1.000	1.000
330	M	Goat-fat w/o bone	0.000012	1.000	1.000
331	M	Goat-kidney	0.000002	1.000	1.000
332	M	Goat-liver	0.000002	1.000	1.000
333	M	Goat-lean (fat/free) w/o bone	0.000002	1.000	1.000
334	M	Horsemeat	0.000002	1.000	1.000

335	M	Rabbit	0.000002	1.000	1.000
336	M	Sheep-meat byproducts	0.000002	1.000	1.000
337	M	Sheep-other organ meats	0.000002	1.000	1.000
338	M	Sheep-fat w/o bone	0.000012	1.000	1.000
339	M	Sheep-kidney	0.000002	1.000	1.000
340	M	Sheep-liver	0.000002	1.000	1.000
341	M	Sheep-lean (fat free) w/o bone	0.000002	1.000	1.000
342	M	Pork-meat byproducts	0.000002	1.000	1.000
343	M	Pork-other organ meats	0.000002	1.000	1.000
344	M	Pork-fat w/o bone	0.000012	1.000	1.000
345	M	Pork-kidney	0.000002	1.000	1.000
346	M	Pork-liver	0.000002	1.000	1.000
347	M	Pork-lean (fat free) w/o bone	0.000002	1.000	1.000
355	P	Turkey-byproducts	0.000003	1.000	1.000
356	P	Turkey-giblets (liver)	0.000003	1.000	1.000
357	P	Turkey--fat w/o bones	0.000090	1.000	1.000
358	P	Turkey- lean/fat free w/o bones	0.000002	1.000	1.000
360	P	Poultry-other-lean (fat free) w/	0.000002	1.000	1.000
361	P	Poultry-other-giblets(liver)	0.000003	1.000	1.000
362	P	Poultry-other-fat w/o bones	0.000090	1.000	1.000
363	P	Eggs-whole	0.000014	1.000	1.000
364	P	Eggs-white only	0.000014	1.000	1.000
365	P	Eggs-yolk only	0.000014	1.000	1.000
366	P	Chicken-byproducts	0.000003	1.000	1.000
367	P	Chicken-giblets(liver)	0.000003	1.000	1.000
368	P	Chicken-fat w/o bones	0.000090	1.000	1.000
369	P	Chicken-lean/fat free w/o bones	0.000002	1.000	1.000
377	11	Apples-juice-concentrate	0.000150	3.000	1.000
378	O	Bananas-juice	0.001000	1.000	1.000
380	13A	Blackberries-juice	0.000900	1.000	1.000
383	5B	Cabbage-savoy	0.000300	1.000	1.000
385	P	Chicken-giblets (excl. liver)	0.000003	1.000	1.000
388	15	Corn grain/sugar-molasses	0.001250	1.500	1.000
392	O	Grapes-juice-concentrate	0.001750	3.000	1.000
393	O	Guava-juice	0.000050	1.000	1.000
398	D	Milk-based water	0.000002	1.000	1.000
402	12	Peaches-juice	0.000700	1.000	1.000
404	11	Pears-juice	0.000350	1.000	1.000
410	12	Apricot juice	0.000500	1.000	1.000
416	O	Strawberries-juice	0.000050	1.000	1.000
424	M	Veal-fat w/o bones	0.000012	1.000	1.000
425	M	Veal-lean (fat free) w/o bones	0.000002	1.000	1.000
426	M	Veal-kidney	0.000002	1.000	1.000
427	M	Veal-liver	0.000002	1.000	1.000
428	M	Veal-other organ meats	0.000002	1.000	1.000
429	M	Veal-dried	0.000002	1.920	1.000
430	M	Veal-meat byproducts	0.000002	1.000	1.000

431	14	Walnut oil	0.001400	1.000	1.000
449	P	Turkey-other organ meats	0.000003	1.000	1.000
452	5B	Bok choy	0.000300	1.000	1.000
480	O	Plantains-green	0.050000	1.000	1.000
481	O	Plantains-dried	0.050000	3.900	1.000
482	O	Soybeans-protein isolate	0.000050	1.000	1.000

Attachment 2: Chronic Residue Analysis for Oxyfluorfen

U.S. Environmental Protection Agency Ver. 7.73
DEEM Chronic analysis for OXYFLUORFEN (1989-92 data)
Residue file name: C:\My DEEM\Oxyfluorfen\111601c1.RS7
Adjustment factor #2 used.
Analysis Date 07-10-2001/12:34:20 Residue file dated: 07-10-2001/12:30:45/8
Reference dose (RfD, Chronic) = .03 mg/kg bw/day
COMMENT 1: RED Chapter Run

Total exposure by population subgroup

Population Subgroup	Total Exposure mg/kg body wt/day	Percent of Rfd
U.S. Population (total)	0.000005	0.0%
U.S. Population (spring season)	0.000005	0.0%
U.S. Population (summer season)	0.000005	0.0%
U.S. Population (autumn season)	0.000005	0.0%
U.S. Population (winter season)	0.000005	0.0%
Northeast region	0.000005	0.0%
Midwest region	0.000005	0.0%
Southern region	0.000005	0.0%
Western region	0.000005	0.0%
Hispanics	0.000008	0.0%
Non-hispanic whites	0.000005	0.0%
Non-hispanic blacks	0.000004	0.0%
Non-hisp/non-white/non-black	0.000005	0.0%
All infants (< 1 year)	0.000011	0.0%
Nursing infants	0.000004	0.0%
Non-nursing infants	0.000013	0.0%
Children 1-6 yrs	0.000012	0.0%
Children 7-12 yrs	0.000009	0.0%
Females 13-19 (not preg or nursing)	0.000004	0.0%

Females 20+ (not preg or nursing)	0.000004	0.0%
Females 13-50 yrs	0.000004	0.0%
Females 13+ (preg/not nursing)	0.000004	0.0%
Females 13+ (nursing)	0.000004	0.0%
Males 13-19 yrs	0.000005	0.0%
Males 20+ yrs	0.000004	0.0%
Seniors 55+	0.000004	0.0%
Pacific Region	0.000005	0.0%

Attachment 3: Cancer Analysis for Oxyfluorfen

U.S. Environmental Protection Agency Ver. 7.73
DEEM Chronic analysis for OXYFLUORFEN (1989-92 data)
Residue file name: C:\My DEEM\Oxyfluorfen\111601c1.RS7
Adjustment factor #2 used.
Analysis Date 07-10-2001/12:36:26 Residue file dated: 07-10-2001/12:30:45/8
Q* = 0.0732
COMMENT 1: RED Chapter Run

Total exposure by population subgroup

Population Subgroup	Total Exposure mg/kg body wt/day	Lifetime risk (Q*= .0732)
U.S. Population (total)	0.000005	3.81E-07
U.S. Population (spring season)	0.000005	3.46E-07
U.S. Population (summer season)	0.000005	3.96E-07
U.S. Population (autumn season)	0.000005	3.96E-07
U.S. Population (winter season)	0.000005	3.82E-07
Northeast region	0.000005	3.86E-07
Midwest region	0.000005	3.78E-07
Southern region	0.000005	3.76E-07
Western region	0.000005	3.86E-07
Hispanics	0.000008	5.79E-07
Non-hispanic whites	0.000005	3.68E-07
Non-hispanic blacks	0.000004	3.25E-07
Non-hisp/non-white/non-black	0.000005	3.65E-07
All infants (< 1 year)	0.000011	7.85E-07
Nursing infants	0.000004	3.27E-07
Non-nursing infants	0.000013	9.78E-07
Children 1-6 yrs	0.000012	9.01E-07
Children 7-12 yrs	0.000009	6.44E-07

Females 13-19 (not preg or nursing)	0.000004	2.78E-07
Females 20+ (not preg or nursing)	0.000004	2.86E-07
Females 13-50 yrs	0.000004	2.98E-07
Females 13+ (preg/not nursing)	0.000004	2.74E-07
Females 13+ (nursing)	0.000004	3.06E-07
Males 13-19 yrs	0.000005	3.71E-07
Males 20+ yrs	0.000004	2.64E-07
Seniors 55+	0.000004	2.58E-07
Pacific Region	0.000005	3.90E-07

Attachment 4:

Quantitative Usage Analysis for oxyfluorfen
Case Number:2490 PC Code:111601
Date: June 4, 2001 Analyst: Jihad Alsadek

Based on available pesticide survey usage information for the years of 1990 through 1999, an annual estimate of oxyfluorfen's total domestic usage averaged approximately 743,000 pounds active ingredient (a.i.) for 1,167,000 acres treated. Most of the acreage is treated with one pound a.i. or less per application and one pound a.i. or less per year. Oxyfluorfen is a broad spectrum herbicide with its largest markets in terms of total pounds active ingredient allocated to wine grapes (32%), almonds (23%), cotton (7%), walnuts (6%), and table grapes (4%). The remaining usage is primarily on apples, corn, raisin grapes, mint, dry onion, ornamentals, peaches, pistachios, prunes, and artichokes. Crops with a high percentage of the total U.S. planted acres treated include wine grapes (54%), artichokes (53%), pistachios (44%), almonds (43%), table grapes and nectarines (35% each), and figs (33%). Bolded rows are for sites that are registered, but have no usage on them. Some sites, with (1) next to them, are unregistered but showed some use. This usage could be due to Section 18 requests, existing stocks of the chemical, data collection errors, or because of an illegal use. Most of the usage is in CA, OR, TX, MN, NM, CT, and WA.

Site	Acres (000) Grown	Acres Ttd (000)		% Crop Ttd		Lb AI Appl (000)		Avg. Appl Rates			States of Most Usage (% of total lb ai used on this site)
		Weighted Average	Est Max	Weighted Average	Est Max	Weighted Average	Est Max	lb ai/ acre/yr	# appl /year	lbai/A /appl	
Apples	520	14	28	3%	5%	13	31	1.0	1.0	0.9	WA CA 82%
Crabapples	-	-	-	-	-	-	-	-	-	-	-
Feijoa (Pineapple Guava)	-	-	-	-	-	-	-	-	-	-	-
Pineapples	**26**	-	-	-	-	-	-	-	-	-	-
Guavas	**1**	-	-	-	-	-	-	-	-	-	-
Apricots	21	2	4	10%	20%	1	3	0.6	1.1	0.5	CA 100%
Avocados	80	3	6	3%	8%	1	2	0.3	1.2	0.3	CA 100%
Blackberries (1)	5	1	2	18%	29%	1	1	0.7	1.8	0.4	OR 100%
Blueberries	59	1	2	2%	4%	1	2	1.0	1.0	1.0	OR 100%
Raspberries	13	4	8	28%	1	1	1	0.2	1.0	0.2	WA OR 100%
Strawberries	48	1	3	1%	5%	1	2	1.4	1.0	1.4	OR WA 100%
Loganberries	-	-	-	-	-	-	-	-	-	-	-
Youngberries	-	-	-	-	-	-	-	-	-	-	-
Cherries, Sweet	52	5	8	9%	15%	2	5	0.5	1.1	0.5	CA OR 92%
Cherries, Tart	49	1	2	2%	4%	1	2	1.0	1.0	1.0	OR 100%
Citron (Citrus)	-	-	-	-	-	-	-	-	-	-	-
Citrus Hybrids Other Than Tangelo	-	-	-	-	-	-	-	-	-	-	-
Lemons	67	1	2	1%	3%	1	2	1.0	1.5	0.7	CA 100%
Limes	**6**	-	-	-	-	-	-	-	-	-	-
Oranges	927	5	23	1%	2%	2	6	0.4	1.0	0.4	CA 96%
Tangelos	**9**	-	-	-	-	-	-	-	-	-	-
Tangerines	37	1	3	2%	7%	1	2	1.8	1.0	1.8	CA 100%
Grapefruit	189	1	2	1%	1%	2	4	2.0	1.0	2.0	TX CA 99%
Dates	**5**	-	-	-	-	-	-	-	-	-	-
Figs	16	5	11	33%	69%	3	6	0.5	1.0	0.5	CA 100%
Grapes, Raisin	284	18	37	6%	13%	5	10	0.3	1.1	0.3	CA 100%
Grapes, Table	107	38	65	35%	61%	30	52	0.8	1.2	0.7	CA 100%

Site	Acres (000) Grown	Acres Ttd (000) Weighted Average	Acres Ttd (000) Est Max	% Crop Ttd Weighted Average	% Crop Ttd Est Max	Lb AI Appl (000) Weighted Average	Lb AI Appl (000) Est Max	Avg. Appl Rates lb ai/ acre/yr	Avg. Appl Rates # appl /year	Avg. Appl Rates lbai/A /appl	States of Most Usage (% of total lb ai used on this site)
Grapes, Wine	478	260	400	54%	84%	240	396	0.9	1.3	0.7	CA 100%
Kiwifruit	**12**	**1**	**4**	**9%**	**29%**	**1**	**4**	**1.3**	**1.0**	**1.3**	**-**
Kumquats	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Nectarines	36	13	22	35%	61%	5	9	0.4	1.1	0.3	-
Olives	36	5	7	13%	21%	5	11	1.2	1.2	0.9	CA 100%
Papayas	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Peaches	259	37	61	14%	23%	24	44	0.6	1.0	0.6	CA 92%
Pears	74	5	15	7%	20%	5	15	1.0	1.0	1.0	CA OR 83%
Persimmons	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Plums	44	11	23	24%	52%	6	11	0.5	1.0	0.5	CA 100%
Pomegranates	3	1	2	26%	54%	1	1	0.8	1.0	0.8	-
Prunes	93	13	20	14%	21%	7	13	0.5	1.1	0.5	-
Pummelo	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Quinces	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Artichokes	10	5	8	53%	78%	4	8	0.8	1.0	0.8	-
Broccoli	126	13	19	10%	15%	2	4	0.2	1.1	0.2	CA 100%
Cabbage, Fresh	72	5	10	6%	13%	1	3	0.3	1.1	0.2	CA NC 93%
Cauliflower	53	13	28	26%	53%	2	4	0.1	1.0	0.1	CA 89%
Corn	77,779	19	43	0.02%	0.1%	7	18	1.0	1.0	1.0	TX CA MN 99%
Sweet Corn, Fresh	189	1	9	0.3%	5%	1	2	1.9	1.1	1.8	-
Cucumbers, Fresh (1)	52	1	3	2%	5%	1	2	1.0	1.0	1.0	-
Eggplant/Peppers (1)	121	1	4	1%	3%	1	2	0.9	1.0	0.9	NM CA 100%
Garlic	**22**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Onions, Dry	248	72	140	29%	57%	15	22	0.2	2.3	0.1	CA GA OR WA 87%
Lettuce, Head	202	2	8	1%	4%	1	3	0.5	1.0	0.5	-
Melons	375	5	13	1%	4%	2	5	0.4	1.0	0.4	CA 100%
Tomatoes, Fresh	106	1	6	1%	6%	1	2	1.0	1.0	1.0	CA 100%
Tomatoes, Proc.	575	45	91	8%	16%	3	6	0.1	1.0	0.1	CA 100%
Roots/Tubers	236	2	11	1%	5%	1	5	0.4	1.0	0.4	CA 100%
Beans & Peas, Dry (1)	2,237	3	5	0.1%	0.2%	1	2	0.4	1.1	0.3	CA 98%
Beans/Peas, Green	708	2	4	0.3%	1%	1	2	0.5	1.1	0.5	CA WI 100%
Soybeans	**66,303**	**5**	**22**	**0.01%**	**0.03%**	**2**	**8**	**0.3**	**1.0**	**0.3**	**MI 92%**
Beech Nut	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Brazil Nut	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Almonds	489	210	420	43%	86%	170	241	0.8	1.5	0.5	CA 100%
Butternuts	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Cashews	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Chestnuts	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Filberts	33	1	3	3%	10%	1	2	0.9	1.0	0.9	OR 100%
Hickory Nuts	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Macadamia Nuts	**18**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Pecans	452	1	2	0.2%	0.4%	1	2	1.0	1.0	1.0	CA 100%
Pistachios	90	40	68	44%	76%	26	45	0.7	1.2	0.5	CA 100%
Walnuts	215	60	90	28%	42%	48	89	0.8	1.3	0.6	CA 100%
Mint	154	27	40	18%	26%	10	15	0.4	1.0	0.4	OR WA IN ID 92%

Cocoa (Beverage Crop)	-	-	-	-	-	-	-	-	-	-	-
Coffee	-	-	-	-	-	-	-	-	-	-	-
Oats/Rye (1)	**5,944**	**1**	**2**	**0.02%**	**0.03%**	**1**	**2**	**1.0**	**1.0**	**1.0**	-
Rice (1)	3,175	1	3	0.03%	0.1%	1	2	1.1	1.0	1.1	CA 100%
Wheat, Winter	43,721	2	4	0.004%	0.01%	2	3	1.1	1.0	1.1	OR 100%
Cotton	13,188	160	352	1%	3%	54	118	0.3	1.1	0.3	CA MS LA AR 81%
Clary Sage	-	-	-	-	-	-	-	-	-	-	-
Red Clover	-	-	-	-	-	-	-	-	-	-	-
Ladino Clover	-	-	-	-	-	-	-	-	-	-	-
Jojoba (Oil Crop)	-	-	-	-	-	-	-	-	-	-	-
Lesquerella (Oil Crop) (Folia)	-	-	-	-	-	-	-	-	-	-	-
Loquat	-	-	-	-	-	-	-	-	-	-	-
Alfalfa	23,665	2	8	0.01%	0.03%	1	3	0.5	1.0	0.5	CA 100%
Fallow Or Idle Agricultural Land	-	-	-	-	-	-	-	-	-	-	-
Leafy Vegetables (Crucifers)	-	-	-	-	-	-	-	-	-	-	-
Sub-Total (Agricultural)		**1,142**	**2,174**			**720**	**1,254**				
Fencerows	-	-	-	-	-	-	-	-	-	-	-
Buildings (Outdoor)	-	-	-	-	-	-	-	-	-	-	-
Lots/Farmsteads/etc (1)	23,987	16	30	0.1%	0.1%	9	15	0.5	1.5	0.4	CA 97%
Ornamentals	-	6	8	-	-	12	23	2.0	1.2	1.7	OR CA WA FL 86%
Pasture/Rangeland, Other (1)	-	3	4	-	-	2	2	0.6	1.0	0.6	OR 89%
Private Roads, Walkways, Path, Right-of-Way	-	-	-	-	-	-	-	-	-	-	-
Sub-Total (Non-AG.)		**25**	**42**			**23**	**40**				
Total (Both AG and Non-AG)		**1,167**	**2,216**			**743**	**1,294**				

COLUMN HEADINGS
Weighted average--the most recent years and more reliable data are weighted more heavily.
Est Max = Estimated maximum, which is estimated from available data.
Average application rates are calculated from the weighted averages.

NOTES ON TABLE DATA
Usage data primarily covers 1990 - 1999.
(1) ~ These are unregistered sites that showed some usage .
A dash (-) indicates that information, on these italicized registered sites, is NOT available in EPA sources or is insufficient.

*** Other/Crop Groups**
Melons include cantaloupe, watermelon, honeydew, muskmelon, and winter melon.
Root and Tuber Crops include red beets, carrots, horseradish, parsnips, radish, rutabagas, sweet potatoes, turnips, and yams.

SOURCES: EPA data (1990-99), USDA/NASS (90-99), CAL EPA (93-95) and National Center for Food and Agricultural Policy (Circa 92).